REMARKS

The present application was filed on July 13, 2000 with claims 1-22. Claims 1, 11, 21 and 22 are the independent claims. In the outstanding Office Action, the Examiner: (i) rejected claims 1, 3, 6-8, 11, 13, 16, 21 and 22 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,064,324 to Shimizu et al. (hereinafter "Shimizu"); (ii) rejected claims 7-10 and 17-20 under 35 U.S.C. §103(a) as being unpatentable over Shimizu in view of U.S. Patent No. 5,604,494 to Murakami et al. (hereinafter "Murakami"); and (iii) indicated allowable subject matter in claims 2, 4, 5, 12, 14 and 15.

Applicants gratefully acknowledge the indication of allowable subject matter in claims 2, 4, 5, 12, 14 and 15.

Regarding the §102(b) rejection of claims 1, 3, 6-8, 11, 13, 16, 21 and 22, Applicants respectfully assert that Shimizu fails to teach or suggest all of the limitations in claims 1, 3, 6-8, 11, 13, 16, 21 and 22 for at least the reasons presented below.

It is well-established law that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). Applicants assert that the rejection based on Shimizu does not meet this basic legal requirement, as will be explained below.

The present invention, for example, as recited in independent claim 1, recites a method for use in a block transform-based decoder, the decoder receiving a signal generated by a block transform-based encoder, the signal representing one or more quantized coefficients associated with at least one block of visual data, and the decoder decoding the signal to yield a decoded visual data block, comprising the steps of: (i) transforming the decoded visual data block to yield a transformed data block; and (ii) applying a constrained quantization and inverse quantization operation to the transformed data block, the constrained quantization operation being conditioned on a comparison of the signal received by the decoder to the transformed data block, the constrained quantization and inverse quantization operation yielding a partially decoded output signal. Independent claims 11, 21 and 22 recite similar limitations.

As the present specification illustratively explains at page 3, lines 13-24, the invention provides methods and apparatus for performing near lossless-concatenated *N*-level transform coding. Such near lossless-concatenated *N*-level transform coding is accomplished by implementing a

transform-based coding methodology using a unique constrained quantization and inverse quantization process, where the coding loss introduced during concatenated coding (repeated encoding and decoding) of a video and/or image signal is reduced to a substantially insignificant level. More particularly, in accordance with the invention, a constrained quantization and inverse quantization methodology is used in a decoder to achieve near lossless concatenated coding, where the quantization operation performed on block transformed coefficients is a conditional one. That is, the outcome of the quantization operation is based on the value of the quantized coefficients that are input to the decoder.

Further, by way of example, the present specification beginning at page 7, line 24, illustratively states:

> We now explain the operation performed on the transformed coefficients in each <u>constrained quantization and inverse quantization module 410</u> of the blocks of the decoder 400. Let $x(n)$ be the input to the decoder (quantized coefficients in the transform domain from an encoder such as is shown in FIG. 1), where $n = 0,1,\ldots,63$, for an 8 x 8 block of data. As can be seen in FIG. 4, $x(n)$ is available to each constrained quantization and inverse quantization module 410 of the decoder as a reference signal. If $y_k(n)$ is the output of a Hadamard transform module 408 at any stage k, $k = 1, 2, \ldots, N$, then the constrained quantization and inverse quantization operation performed on $y_k(n)$ yields $z_k(n)$ according to the following rule:
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> $$\begin{aligned} z_k(n) &= y_k(n) && \text{if } Q(y_k(n)) = x(n) \\ &= x(n) * q && \text{if } Q(y_k(n)) \neq x(n) \end{aligned}$$
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> where q is the quantization step size used for the current block, and $Q(y_k(n))$ represents the quantized value of $y_k(n)$. Thus, $x(n)$ is the constraint or reference against which the quantization of the output $y_k(n)$ of module 408 is performed in module 410. In the absence of concatenated coding loss, i.e., if there is no new error introduced after clipping (module 406) the output of the inverse Hadamard transform (module 404) to 10 bits, then $y_k(n) = x(n) * q$ and $z_k(n) = y_k(n)$. Under the presence of concatenated coding loss however, $y_k(n) \neq x(n) * q$, and two situations arise. If $Q(y_k(n)) = x(n)$, then module 410 does not perform any quantization, and its output $z_k(n) = y_k(n)$. But in the case when $Q(y_k(n)) \neq x(n)$, the output $z_k(n)$ of module 410 is set to $x(n)$, i.e., $z_k(n) = x(n) * q$.
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> Let us consider a simple example to explain the above situation. Let the quantization parameter be $q = 5$, and let the reference signal be $x(n) = 3$. Then, three situations may arise. In the absence of concatenated coding loss, the output of the Hadamard transform block, module 408, will be $y_k(n) = 15$, by definition, so that $Q(y_k(n)) = x(n) = 3$ and the output of module 410 would be $z_k(n) = 15$, i.e., $z_k(n) = y_k(n)$. In the second situation, let $y_k(n) = 17$, i.e., concatenated coding loss is present since $y_k(n) \neq x(n) * q$, but $Q(y_k(n)) = x(n) = 3$. In this case, we do not perform any quantization, and the output to module 410 remains identical

to its input, i.e., $z_k(n) = 17$. In the third and final situation, let $y_k(n) = 12$, i.e., like in the previous case, there is concatenated coding loss, but also $Q(y_k(n)) = 2$, so that $Q(y_k(n)) \neq x(n)$. In this case, we constrain the output $z_k(n)$ to equal the reference signal, i.e., $z_k(n) = x(n) * q = 15$.

Shimizu discloses encoding and decoding techniques. As shown in the encoder of FIG. 1 of Shimizu, coefficients of an orthogonal transformation are quantized in quantizer 300. As shown in the decoder of FIG. 2 of Shimizu, the quantized coefficients are inverse-quantized in inverse quantizer 700. The invention of Shimizu appears to be directed toward how to determine the quantization width Qk used by the inverse quantizer 700. It appears that the inverse-quantization process in Shimizu takes into account an amount of generated encoded data G and an amount of target encoded data T.

However, the decoder operations in Shimizu are not the same as the decoder operations of the claimed invention. First, as explained above, the claimed invention recites (i) transforming the decoded visual data block to yield a transformed data block; and (ii) applying a constrained quantization and inverse quantization operation to the transformed data block, the constrained quantization operation being conditioned on a comparison of the signal received by the decoder to the transformed data block, the constrained quantization and inverse quantization operation yielding a partially decoded output signal. Thus, as is evident (and underlined above for emphasis), the signal received by the decoder of the claimed invention is first decoded before being subjected to the transforming operation and the constrained quantization operation of the claimed invention.

By way of example only, FIG. 4 of the present application shows the received signal being inverse-quantized in block 402 and then inverse-transformed in block 404. The resulting decoded signal is then applied to the transformation block 408 and then to the constrained quantization and inverse-quantization block 410 of the invention. The constrained quantization operation is conditioned on a comparison of the signal received by the decoder (x(n)) to the transformed data block y(n)).

Whether any operation in the decoder of Shimizu is "constrained" in any way, Shimizu still fails to disclose applying a transformation operation and then a constrained quantization and inverse quantization operation on the decoded signal. That is, Shimizu merely inverse-quantizes the received signal but never performs another quantization operation, no less a constrained quantization operation as in the claimed invention.

Furthermore, regarding whether any operation in Shimizu is "constrained" in any way, Applicants do not agree with the assertion made in the Office Action. First, the Office Action states that the Shimizu technique is "conditioned on a comparison of the signal received by the decoder to the transformed data block," as in the claimed invention, but then offers as support a comparison made in Shimizu at equations (3) through (6) between an amount of generated encoded data G and an amount of target encoded data T. The two comparisons are clearly not the same.

For at least these reasons, Applicants respectfully request withdrawal of the §102(b) rejection of independent claims 1, 11, 21 and 22.

In addition, Applicants respectfully assert that dependent claims 3, 6-8, 13 and 16 are patentable over Shimizu not only due to their respective dependence on claims 1 and 11, but also because such claims recite patentable subject matter in their own right. For at least these reasons, Applicants respectfully request withdrawal of the §102(b) rejection of claims 3, 6-8, 13 and 16.

Regarding the §103(a) rejection of claims 7-10 and 17-20, Applicants not only assert that Murakami is deficient for the reasons given in Applicants' previous response dated October 31, 2003, but also that Murakami is deficient for similar reasons as presented above with regard to Shimizu. For at least these reasons, Applicants respectfully request withdrawal of the §103(a) rejection of claims 7-10 and 17-20.

Furthermore, Applicants assert that the Office Action fails to provide sufficient support for properly combining Shimizu and Murakami.

The Federal Circuit has stated that when patentability turns on the question of obviousness, the obviousness determination "must be based on objective evidence of record" and that "this precedent has been reinforced in myriad decisions, and cannot be dispensed with." In re Lee, 277 F.3d 1338, 1343 (Fed. Cir. 2002). Moreover, the Federal Circuit has stated that "conclusory statements" by an examiner fail to adequately address the factual question of motivation, which is material to patentability and cannot be resolved "on subjective belief and unknown authority." Id. at 1343-1344.

In the Office Action at page 4, the Examiner provides the following statement to prove motivation to combine Shimizu and Murakami, with emphasis supplied: "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the scheme of Murakami in the method of Shimizu in order to reduce the artifacts of the image by reducing the rounding error."

Applicants submit that this statement is based on the type of "subjective belief and unknown authority" that the Federal Circuit has indicated provides insufficient support for an obviousness rejection. More specifically, the Examiner fails to identify any objective evidence of record which supports the proposed combination.

Applicants also challenge the taking of Official Notice at page 4 of the Office Action since it must be shown that there is proper motivation in a reference teaching Hadamard transforms to combine it with Shimizu and Murakami in order to achieve the claimed invention.

For at least these reasons, Applicants respectfully request withdrawal of the §103(a) rejection of claims 7-10 and 17-20.

In view of the above, Applicants believe that claims 1-22 are in condition for allowance, and respectfully request favorable reconsideration.

Respectfully submitted,

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